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Marine Casualty Investigations

Enquêtes sur les accidents maritimes

Investigation Report to the Minister pursuant to sections 542 or 545 of the Canada Shipping Act

Rapport d'investigation au Ministre conformément aux articles 542 ou 545 de la Loi sur la marine marchande du Canada

Canada

Ce rapport est aussi disponible en français

REPORT OF INVESTIGATION INTO THE CIRCUMSTANCES ATTENDING THE CAPSIZE OF THE CANADIAN FISHING VESSEL "GARY & BURL" WITH THE LOSS OF THREE LIVES, AND THE RELATED CASUALTIES INVOLVING THE CANADIAN FISHING VESSELS "LADY LISA", "NEW WAY"; "HUGUETTE-SONIA" AND "FUZZY", DURING A GALE OFF MISCOU ISLAND, N.B., SEPTEMBER 6, 1988.

REPORT No. 517

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REPORT OF INVESTIGATION INTO THE CIRCUMSTANCES ATTENDING THE CAPSIZE OF THE CANADIAN FISHING VESSEL "GARY & BURL" WITH THE LOSS OF THREE LIVES, AND THE RELATED CASUALTIES INVOLVING THE CANADIAN FISHING VESSELS "LADY LISA"; "NEW WAY"; "HUGUETTE-SONIA" AND "FUZZY", DURING A GALE OFF MISCOU ISLAND, N.B., SEPTEMBER 6, 1988.

Particulars of Vessel

Name	"GARY & BURL"
Official Number	329972
Port of Registry	Caraquet, N.B.
Gross Tonnage	12
Net Tonnage	11
Length (O.A.)	12.32 m
Registered Length	11.0 m
Breadth (Mld)	3.56 m
Depth (Mld)	1.43 m
Built	1968, at Shemogue, N.B.
Propulsion	One Ford Senator diesel engine, 131.5 bhp, driving a single fixed pitch propeller
Service speed	Between 8 and 9 knots
Fishing Service	Gill-netting herring
Crew	Three (3) persons
Owner/operator	Mark Lloyd Vibert Miscou Centre, N.B.

Navigating and Communications Equipment

The following equipment was reported to be onboard and in good working order:

Echo-sounder/fish finder (2)	Furuno and Raytheon
Loran C (1)	Apelco
V.H.F. (1)	Ray Jefferson

Citizens-band radio (1)	Realistic
Magnetic compass (1)	Airguide

Pumps

The following equipment was reported to be onboard and in good working order:

Electric (12V) submersible pumps (2)	Located in bilges under fish hold, P.&S. abreast main engine compartment
Jabsco pump, gear-driven off main engine (1)	With suction in main engine compartment
Honda gasoline engine driven portable pump (1)	Located on deck for general service with flexible hose suctions and discharge piping
50 mm diameter solids pump, electrically driven from Honda gasoline generator on wheel-house top (1)	Used for general service and pumping fish waste and scales from the fishhold after cargo discharge

Life-saving Appliances

The following equipment was reported to be onboard and in good condition:

Lifejackets	Two (2) of the "Keyhole" type
Personal flotation devices	Three (3) of the sleeveless vest type
Lifebuoy and line	One (1) bearing vessel name and number
Distress signals	One (1) box of red flares

Particulars of Deceased Persons

Name	Mark Lloyd Vibert
Age	35 years
Address	Miscou Centre, N.B.

Position on board	Operator/owner
Name	Richard Frederick Vibert
Age	25 years
Address	Miscou Plains, N.B.
Position on board	Seaman/fisherman

Particulars of Missing Person

Name	Brian Wallace Vibert
Age	18 years
Address	Miscou Harbour, N.B.
Position on board	Seaman/fisherman

Description of Vessel

The "GARY & BURL" was typical of the many small inshore fishing vessels engaged in gill-netting for herring in the Baie des Chaleurs off Miscou Island, N.B. She was originally of open construction, but at the time of the casualty the open well was enclosed with a plywood deck fitted at gunwale level, providing underdeck stowage for the bulk herring catch. Two full width transverse wooden bulkheads subdivided the hull into three principal compartments, namely, lazaret, fishhold and crew cabin space. The main engine compartment located on the centre line at the forward end of the fishhold was enclosed by wooden structural bulkheads which extended up to gunwale level, the deckhead of which incorporated a flush access hatch and seating for a hydraulically driven gill-net drum winch. The wheel-house and access to the crew cabin were arranged forward of the engine compartment, hand hydraulic steering gear together with a 400 L capacity oil fuel tank were located in the lazaret, and a steel net roller was fitted across the transom bulwark toprail.

In the absence of any existing drawings or photographs of the "GARY & BURL", the Outline General Arrangement, (Figure N° 1), was prepared from examination and measurement of the beached and wrecked hull, together with supplementary information from close relatives of the deceased operator/owner.

Note: (1) All times in the report are expressed in Atlantic Daylight Saving Time. (UTC minus 3 hours).

(2) A glossary of abbreviations and terms can be found following the Findings of this report.

Background

The "GARY & BURL" departed Miscou Harbour, N.B. at 1930, Monday September 5, 1988, with three (3) persons onboard, bound for fishing grounds approximately 2.5 to 3.5 miles north of Northwest Miscou Point, where some 300 other small fishing vessels also intended gill-netting for herring.

A gale warning was broadcast at 2300, and shortly after midnight the weather rapidly deteriorated causing the fishing fleet to disperse and seek shelter. By 0200, September 6, the westerly winds and seas were 35 knots and 4.6 m high, and at approximately 0230, the "GARY & BURL" radioed that she was taking on water and that her stern was awash. Shortly thereafter, in response to a call from a nearby vessel, the "GARY & BURL" fired a red flare which was sighted by at least two other fishing boats, the nearest of which steered toward the distress signal, but in the dark and confused stormy conditions, the "GARY & BURL" could not be located.

Sometime after dawn the capsized hull of the "GARY & BURL" was located on the west coast of Miscou Island at 47°58.36'N, 64°32.52'W, grounded some 275 metres from the beach. Shortly afterwards the body of one of the crew, wearing a personal flotation device, was found on the beach approximately 1 km to the north of the wreck. Later that morning, relatives of the crew with the aid of a pay-loader, succeeded in righting and beaching the hull, but no survivors were found onboard.

Subsequently, on September 11, 1988, the body of the operator, not wearing a lifejacket, was found on the beach near Northwest Miscou Point. At the time of writing this report, the third member of the crew is still missing and is presumed to have drowned.

The "GARY & BURL" was declared a total loss, with an estimated value of $40,000.

Narrative

The gill-netter "GARY & BURL" sailed from Miscou Harbour at 1930, on Monday, September 5, 1988, with a crew of three onboard bound for the herring fishing grounds some 2.5 to 3.5 miles north of Northwest Miscou Point. The weather on departure was clear, with a southwesterly wind of 6 to 8

knots and slight seas. The weather gradually deteriorated after her departure and a gale warning for the Chaleur/Miscou area, predicting westerly winds of 25 to 35 knots due before dawn, was broadcast at 2300.

Shortly after midnight the weather rapidly deteriorated with heavy rain squalls, westerly winds of 20 to 25 knots and short steep waves, estimated by many fishermen to be 3.7 m high. As the weather worsened the majority of the concentrated fishing fleet, estimated at that time to number some 280 vessels, ceased fishing and dispersed to return to their home ports or seek shelter in the lee of Miscou Island. The heavy rain squalls passed and at about 0100, the wind, remaining westerly, was estimated to be 25 knots gusting to 35 knots, and the waves 4.6 m high.

At approximately 0230, the fishing vessel "LA BELLE BLONDE II" was abeam of Miscou Flat buoy and bound for Miscou Harbour with the disabled fishing vessel "GRENDA" in tow, when she received a citizens-band radio call on Channel 11 from the "GARY & BURL". The message gave Loran position coordinates indicating that the "GARY & BURL" was then approximately .75 mile astern and inshore of "LA BELLE BLONDE II". It was also reported that she had taken-on water, the stern was nearly awash, and that the main engine was still running but water was rising in the engine room. The "LA BELLE BLONDE II" replied that she could not respond in the stormy conditions because she was already towing a disabled vessel, and suggested that the "GARY & BURL" fire a distress flare to attract and direct any other nearby vessels to her assistance. The fishing vessel "BABY DOLL IV", approximately 1 mile astern of the "LA BELLE BLONDE II", overheard part of the English conversation between the other two vessels, and after direct contact with "LA BELLE BLONDE II", seeking further clarification in French, sighted a red signal flare off her port bow. The "BABY DOLL IV" altered course toward the distress signal, and shortly after it extinguished, obtained a target on her radar screen which was directly ahead.

The "LA BELLE BLONDE II" did not sight any distress flares and at about 0240, the last radio message she heard from the "GARY & BURL" said that the engine had stopped, the batteries were nearly submerged, and 'the stern of the boat was giving up', and finally ..... 'help us quickly'.

The "LA BELLE BLONDE II" made several attempts to broadcast a Mayday alert but was unsuccessful because of a defect which developed in her VHF radio. After securing the "GRENDA" in Miscou Harbour at approximately 0340, the operator of the "LA BELLE BLONDE II" boarded another vessel

and by using Channel 68 on her radio, succeeded in contacting the CCGC "SHIPPEGAN" and the CCG radio station at Rivière-au-Renard, P.Q., (VCG). The "SHIPPEGAN", which was engaged with search and rescue efforts to the east of Miscou Island relayed the distress message to the same radio station on the designated emergency Channel 16, and a Mayday Relay was issued by VCG at 0420.

In the confused and stormy conditions there was considerable interference on the radar screen of the "BABY DOLL IV", as she continued heading toward the prominent radar target. At about 0315, when the echo-sounder indicated only 0.9 m of water under the keel, the radar target was sighted directly ahead, and identified as the fishing vessel "LADY LISA", which was further inshore, apparently abandoned and aground at 47°56.04'N, 64°35.51'W. The "BABY DOLL IV" then retraced her way to deeper water and headed into westerly winds and seas estimated to be 35 knots and 4.6 m high, to gain safe searoom before returning to Miscou Harbour.

At approximately 0235, the fishing vessel "RUBBER DUCK", operated by a brother of the operator of the "GARY & BURL", when some 3.5 miles to the NE of Northwest Miscou Point, overheard parts of a radio conversation between the "LA BELLE BLONDE II" and "GARY & BURL". The operator of the "RUBBER DUCK" contacted his brother on CB channel 11 to clarify the situation and learned that the fishhold hatch covers had been washed away by seas taken on board; the main engine was stopped due to seawater in the engine space; the electrical batteries were nearly submerged; the stern was awash, and the portable gasoline engine driven deck pump could not cope with the water being shipped. The last message received by the "RUBBER DUCK", from the "GARY & BURL" before radio communication was lost at approximately 0240, was 'watch for my flare'. Shortly thereafter the "RUBBER DUCK" sighted a red distress flare in the sky to the SW, visible above the low lying land of Northwest Miscou Point.

The "RUBBER DUCK" headed into westerly gale force winds and seas, slowly rounded Northwest Miscou Point buoy and began searching in the general area of the distress flare sighting. Sometime later a capsized hull was sighted close inshore which, upon closer inspection by a shore search party previously alerted by CB radio, was found to be the "GARY & BURL". Buffalo aircraft R457 from 417 Squadron, Summerside, P.E.I., arrived on scene and at 0717, also located and identified the capsized vessel, and extended the search for the missing crew members.

Shortly afterwards the body of one of the crew of the "GARY & BURL", wearing a sleeveless personal flotation

device, was recovered by the search party approximately 1 km to the north of the wreck. An ambulance was summoned, the body transported to the hospital at Lameque, N.B., and upon examination declared dead.

After arrival at Miscou Harbour, the operator of the "RUBBER DUCK" joined another brother and the beach search party, and succeeded with the aid of a front-end loader in attaching a wire to the grounded and capsized hull. The "GARY & BURL" was then hauled nearer shore, righted and searched, but no survivors were found inside the hull. The bilge planking of the righted but waterlogged hull was then stove-in with the front-end loader in order to free the entrapped water, enabling the lightened hull to be hauled clear and beached above the tide line.

Wreckage of the superstructure and wheel-house, identified as part of the "GARY & BURL", together with sundry items of fishing gear and ship's outfit, including two keyhole type lifejackets were found by the beach search party, washed ashore close to the wreck.

On September 7, after the stormy weather had subsided, the main engine and hydraulic gill-net reel, together with a torn gill-net in which a 61 kg fishing anchor was entangled, were recovered from the beached hull. Fragmented plywood panels believed to be parts of the plywood decking were also found scattered on the beach as far as approximately 1 mile to the north of the wreck.

Analysis

1. History and construction "GARY & BURL"

The "GARY & BURL" was built in 1968, at Shemogue, N.B. as a single screw lobster/scallop fishing boat of open construction. She was of round bilge form and the wooden hull was planked with 28 mm (11/8") thick edge-nailed black spruce over sawn floors and juniper sprung and nailed framing. The keel, stem, sternpost and horn timber were of locally grown hardwood and the wheel-house was of framed single skin 15 mm (5/8") thick plywood construction. All hull scantlings and fastenings were in accordance with the then currently accepted standards and generally followed traditional New Brunswick small fishing vessel building practice.

The vessel was purchased by Mark Vibert in 1981, and operated as an open boat until the summer of 1986, when, in preparation for the herring gill-netting season, a 19

and 16 mm (3/4 & 5/8 inch) thick plywood platform deck was installed to enclose the open well and provide underdeck stowage for the bulk herring catch. Six flush fitting plywood hatch covers, each measuring approximately 1.15 m x 0.84 m, were incorporated in the deck to provide easy access to the hold when discharging in port. Each of the hatch covers was fitted with a 300 mm x 300 mm, square sliding panel to facilitate the underdeck stowage of the herring catch while at sea. All of the plywood covers rested on wooden bearers and no gasket seals or securing devices were fitted to ensure that they were watertight and remained in place.

A steel stern roller and wooden bulwark of edge-nailed construction approximately 400 mm high were also added at this time; the bulwark extending across the transom and forward on each side of the boat to abreast the wheel-house.

The "GARY & BURL" participated in the 1986 herring-roe season, and in the spring of 1987, the underwater hull was double planked from the light load waterline to the garboards with 25 mm (1") thick edge-nailed cedar sheathing. Reportedly this work was done in an effort to stiffen the 19 years old hull and eliminate minor but recurring leaks near the keel.

In August 1987, the vessel was re-engined with a Ford Lehman marine diesel engine, however because of unsatisfactory mechanical operation, this was replaced in June 1988, with a new Ford Senator diesel engine similar to the original as-built installation.

2. Hull inspections "GARY & BURL"

As a small fishing vessel of less than 15 GRT, the "GARY & BURL", was not subject to regulatory hull inspection by the Ship Safety Branch of the Canadian Coast Guard.

In November 1985, prior to the installation of the plywood platform deck, and while afloat at Miscou, N.B., the vessel was inspected by a marine surveyor for insurance purposes. Subject to satisfactory incorporation of two recommendations with respect to propane gas stowage and provision of fire extinguishing equipment, the hull, machinery and outfit were found to be in 'good' condition. Thereafter, coverage was retained annually, and the standard practice of the insurance company for renewal of insurance coverage for vessels of the age of the "GARY & BURL", called for re-inspection every 3 years; consequently the "GARY & BURL" was next

due for hull insurance inspection in November, 1988.

3. Condition of wrecked vessel

Post casualty inspection of the beached vessel on September 8, 1988, showed that the basic as-built wooden hull was largely intact, that debris from the disintegrated wheel-house and superstructure had washed ashore near the wreck, and that the retro-fitted plywood deck and port and starboard side bulwarks had separated from the hull and were missing (See Photographs N^{OS} 1 to 4).

Further examination showed that the keel, stem, sternpost, skeg and transom were intact, and the edge-nailed hull planking, clear of where it had been intentionally stove-in or damaged during the salvage operations, was sound, with seams and butts tight and unsprung. The planking fastenings at the hooded-ends of the stem and sternposts and in way of the garboards were intact, and the edge-nails, where exposed in way of the stove-in planking, were bent, slightly corroded but still sound.

The steel rudder, rudder stock, trunk and gland, propeller, sterntube and stainless steel shafting, were in place and showed no signs of damage or major misalignment.

The wooden bulkheads enclosing the engine compartment and forward end of the fishhold had been removed, and the main engine and engine fittings salvaged. The exposed engine bearers, transverse floors and hull penetration fittings of the main engine keel cooling piping system were intact and secured to the hull planking.

The bottom of the fishhold, which had originally been the sole of the open well was not in place, and the exposed transverse floors and framing had no nail, screw or bolt holes for any fastenings intended to secure the hold bottom lining in place. The original as-built 300 mm wide by 38 mm (1½") thick strip planked side decks in way of the fishhold had separated from the hull planking at gunwale level. The side deck seams were sprung and set up exposing the horizontal edge-nail fastenings, many of which were found to be heavily corroded and to have been sheared through.

No nail, screw of bolt holes were found for any fastenings intended to secure the perimeter of the plywood deck panels to the original side decks. Reportedly the perimeter of the plywood decking had been

fitted with a wooden covering batten, overlapping but not attached to the side deck planking, which was then nailed through the plywood onto wooden beams spanning the vessel from port to starboard. The beams were fitted under the side decks and each of their ends secured by a 12 mm ($\frac{1}{2}$") diameter steel bolt, holes for which were located in the original ship side structural knees.

The transom planking was found to be intact and the horizontal seams and fastenings tight and sound. The fastenings and construction of the transom boundary were found to be intact, and previously fitted repair tingles and caulking at the hull planking ends were in place and undisturbed. The hull structure in way of the transom was substantially intact, despite the pounding to which it had been subjected while grounded and during salvage operations. (See Photograph N° 2).

The port and starboard side bulwarks were missing and precise details of their freeing port arrangements are not known, however, the transom bulwark was still intact and photographs taken during the salvage operations showed one of its two 180 mm x 80 mm freeing ports to have been shut off by a vertical sliding closing panel.

The after deck in way of the lazaret was not of edge-nailed construction and the planking seams while generally tight, were not caulked. There was no hatch in the after deck giving access to the lazaret and steering gear, this being provided by way of portable panels incorporated in the transverse bulkhead separating the lazaret from the fishhold. Consequently the bulkhead was not watertight, and upon fish being loaded into the hold, the lazaret would become inaccessible. The portable panels were not in place when the wreck was inspected, however the remaining wooden structure forming the boundaries of the panel openings indicated that the panels had comprised most of the bulkhead area. Furthermore the remaining structure gave no indication of any means of securing the panels or of keep channels for longitudinal pen-board divisions, reportedly fitted to port and starboard of the fishhold centreline. (See Photographs N^{OS} 3 & 4).

By the time the vessel was righted the superstructure had completely disintegrated, but the 4.65 m long by 150 mm diameter stainless steel tubular mast was recovered, attached to the hull by some rigging wire. Examination showed that the masthead was split, and the ends of the pipe walls were curled inward, - damage consistent with

it having been the first part of the capsized vessel's structure to have come in contact with, and been pounded on, the sea floor.

In summary, the original as-built hull structure after some 20 years of regular and hard service was still basically sound, however, the construction, scantlings, and fastenings of the retro-fitted plywood deck and flush hatch covers enclosing the original open well were less substantial and, in the event, proven non-watertight.

4. Loading and Trim of "GARY & BURL"

The precise loading, freeboard and trim of the "GARY & BURL" when she left the fishing grounds to return to port are not known, however, based upon previous similar voyages and by comparison with the catches reportedly made by similar vessels concurrently on the same fishing ground for the same length of time before the onset of the storm, it is likely that she was full or nearly fully loaded with the maximum allowable landed catch of 80 barrels of herring. Measurements taken from the wrecked hull show that the fishhold volume was approximately 10 cu.m. and thus capable of stowing 80 barrels of whole bulk herring below deck, with the flush hatch covers in place.

Based upon the location of the fishhold aft of amidships and recollections of previous voyages with full or nearly full loads of herring totaling some 9,090 kg (20,000 lbs), the amidships freeboard is estimated to have been approximately 580 mm. Similarly, because of the marked after trim of the loaded vessel, the effective freeboard at the transom is estimated to have been some 330 mm. It would appear that these or similar freeboards had proved adequate in the past in less severe conditions, but, in this instance, were insufficient to prevent excessive quantities of water from being shipped and retained onboard.

5. Pumps and drainage - "GARY & BURL"

Reportedly the vessel was equipped with five (5) pumps, two of which were portable gasoline and electric motor driven and located on deck, where they and their operators were exposed to the weather.

The portable pumps were intended to serve the fishhold, however their flexible suction pipes could only be used when the flush hatch covers in the weather deck were

partially opened or completely removed, thus making the vessel more susceptible to downflooding from any seas shipped and retained on deck in heavy weather.

The gasoline driven generator which supplied electrical power to the 50 mm diameter fishhold waste discharge portable pump, was found on the seabed some 100 m to seaward of the wreck during the post-casualty underwater search for missing crew members. No trace was found of the portable Honda gasoline engine driven pump reportedly in use before radio communication with the "GARY & BURL" ceased.

It is not known if the two 12V electric bilge pumps installed abreast the machinery compartment were utilised, however their location was such that their suctions were not capable of clearing the lazaret bilges when the vessel was loaded and trimmed by the stern. When fish were loaded in the hold, the lazaret was inaccessible and any water shipped and retained in the lazaret bilges would remain undetected until the accumulation was enough to noticeably increase the after trim of the vessel and so alert the crew. Furthermore, the reported location of the electric bilge pumps was such that once fish were loaded into the hold, they were not readily accessible for clearing should their suctions become obstructed with any debris.

Because the electrical supply and starting batteries were located below deck adjacent to the main engine, they were highly vulnerable to shorting-out from the surging effects of relatively low levels of bilge water, and because they also supplied 12V current to the bilge pumps, it is likely these were also adversely affected or rendered inoperative at about the same time that radio contact was lost.

6. Life-Saving Appliances "GARY & BURL"

As a small fishing vessel of less than 15 GRT, the "GARY & BURL" was not subject to regulatory inspection by the Ship Safety Branch of Canadian Coast Guard, however, it is the responsibility of the operator to ensure that lifesaving appliances in accordance with the requirements of the Small Fishing Vessel Inspection Regulations, (S.F.V.I.R.), are provided onboard the vessel.

Section 53, (3) of Part II of the S.F.V.I.R. states:

(3) Every fishing vessel of open construc-

tion exceeding 7.9 m but not exceeding 12.2 m in length shall carry

(a) one approved lifejacket for each person, or one approved lifebuoy for every two persons on board the vessel;

(b) one approved lifebuoy fitted with 27 m of line, but such lifebuoy need not be additional to any lifebuoys carried pursuant to paragraph (a); and

(c) one watertight can containing six self-igniting red flares.

Of the life-saving appliances reportedly on board the "GARY & BURL" at the time of the casualty, two approved 'keyhole' type lifejackets and one sleeveless vest type personal flotation device were washed ashore and recovered from the beach near the wreck. The recovered body of one of the crew members was wearing a sleeveless vest type personal buoyancy device, while that of the operator was found without any buoyancy aid. The crew member whose body was recovered was reportedly a strong swimmer who routinely wore his own sleeveless vest type buoyancy device while fishing, and it would appear that the other two crew members did not don lifejackets during the stormy conditions. At the time of writing this report, the lifebuoy and attached line has not been recovered and the third crew member is still missing and is presumed to have drowned.

The lifesaving equipment outfit of the "GARY & BURL", did not include a lifeboat, dory, inflatable liferaft, EPIRB, or immersion suits, nor were they required by regulation.

7. Most likely time and location of the loss of the "GARY & BURL"

The time of the loss of the "GARY & BURL" cannot be precisely determined, however, the first CB radio distress message and communication with the "LA BELLE BLONDE II", was at approximately 0230; the distress flare was sighted by the "BABY DOLL IV" shortly thereafter, and the last CB radio message was heard at about 0240.

In the dark and stormy conditions the distance to the distress flare could not be judged accurately, and the radar set of the "BABY DOLL IV", which was set on the 4

miles range, was much affected by sea clutter interference and showed no discernable target close at hand. On turning to port and heading in the direction of the flare sighting, the only prominent target clear of the sea clutter on the radar screen was directly ahead. Lacking any visual sighting, the "BABY DOLL IV" continued at approximately 3 knots for about 35 minutes until she entered shallow water and found the prominent target to be the "LADY LISA", not the "GARY & BURL". When retracing her course seeking deeper water, no prominent radar target was located ahead of the "BABY DOLL IV", and it may be concluded that by that time the "GARY & BURL" had either capsized or was waterlogged and completely awash, leaving little or no structure above the surface to present a radar reflection. In this regard, it should be noted that the "LADY LISA" was fitted with a radar reflector at her masthead, while it cannot be established if the "GARY & BURL" was similarly equipped.

In view of the above, it is estimated that the casualty to the "GARY & BURL" occurred some time between 0245 and 0315, when located approximately 1 mile to the east-northeast of Miscou Flat buoy. Subsequently the capsized hull was found after first light, grounded some 275 m off the beach in position 47°58.36'N, 64°32.52'W. These positions indicate a drift of approximately 2.75 miles in a east-northeasterly direction in some 4 to 4½ hours, which is consistent with the prevailing weather and tidal conditions. (See Figure N° 2).

During the post-casualty underwater search for missing crew members, dead herring were found on the seabed in approximately 7.6 m of water, some 245 m to the west-southwest of the wreck. Approximately 100 m offshore and in line between the dead fish and the vessel, the Underwater Recovery Unit of the RCMP also found the vessel's portable gasoline driven generator lying on the seabed. The location of the debris is consistent with the vessel's estimated line of drift, and it is considered likely that the herring catch was lost when the plywood deck was completely dislodged as a result of severe jolting from the masthead of the capsized vessel coming in contact with the seabed.

The precise location of the actual capsize cannot be determined, as it is equally possible that the vessel capsized at sea shortly after the distress flare was fired, or she may have capsized in the breaking seas close to the beach after having been driven shoreward in a waterlogged condition. It should be noted that in

either of these cases, the vessel would not have presented a ready radar target for any searching vessel, or have been highly visible in the dark and stormy conditions.

8. **Most likely cause and sequence of flooding onboard the "GARY & BURL"**

Because the crew were lost and there were no other eyewitnesses, the precise sequence of events leading to the loss of the "GARY & BURL" are not known. However, based upon the radio communications from the vessel just prior to her loss, the post-casualty inspection of the wrecked hull, and further details from persons familiar with the vessel, the most likely causes of the reported flooding may be reasonably deduced.

The derived casualty loading, trim and freeboards indicate that in the prevailing severe weather conditions the "GARY & BURL" was trimmed by the stern and highly susceptible to shipping seas on deck. The layout of the largely intact port and starboard bulwarks extending from the transom to abreast the wheel-house, together with the flush non-watertight fishhold hatch covers arranged in the weather deck, ensured that a significant portion of any water shipped in bad weather would be retained on deck and find its way into the fishhold. The transverse bulkhead at the after end of the fishhold was not watertight and shipped water entering the nearly full fishhold would, because of the vessel's trim, very soon gravitate aft and enter the lazaret. Because the lazaret was inaccessible, the crew would not have been aware of this accumulation until the after trim of the vessel had increased sufficiently to attract notice, by which time the electric bilge pumps suctions near amidships would be ineffective. Reportedly shortly before radio communication with the "GARY & BURL" was lost her portable gasoline engine driven pump was utilised. However, for its flexible hose suction to be effective, at least one of the fishhold flush hatch covers and/or the engine room cover would have had to be opened, which in turn, would have contributed to an increase in the rate of downflooding. As the downflooding continued, the increasing weight of accumulated water would have increased the after trim and further decreased the effective freeboard, the whole situation becoming progressively worse.

This sequence of downflooding is considered to be the most likely cause of the accumulation of water in the hull, and it would appear that the reference to "the

stern is giving up", made during radio communications from the "GARY & BURL", simply meant that the after end of the vessel was no longer rising with or above the seas, and not that any major structural failure had occurred. Furthermore, detailed examination of the beached wreck showed the stern structure and fastenings in way of the transom and rudder trunk to be intact, with previously completed repairs and caulking still in place and undisturbed, despite the pounding incurred while the vessel was aground and being salvaged. (See Photograph N° 2).

9. **Stability of "GARY & BURL"**

As a small fishing vessel of less than 15 GRT, the "GARY & BURL" was not subject to regulatory inspection by the Ship Safety Branch of the Canadian Coast Guard, nor was she required to comply with any regulatory stability standard.

When the "GARY & BURL" was built in 1968, no sisterships were produced, no record was made of the hull lines, and no construction plans were retained by the builder. In common with the vast majority of locally built small fishing vessels, design data and hydrostatic particulars were never prepared and the vessel was not the subject of an inclining experiment or a rolling period test. Consequently the transverse stability of the "GARY & BURL" at the time of her loss is not known, nor can it be accurately derived. In this regard, it should be noted that the vessel was operated for the last 7 years by the same experienced operator, and had been in service for some 20 years without any reported stability related mishap.

The "GARY & BURL" was built and operated as an open boat until the summer of 1986, at which time a plywood deck was installed to enclose the open well and provide underdeck stowage for herring in bulk. The enclosed fishhold was capable of stowing some 80 barrels, or 9,090 kg (20,000 lbs) of herring which, together with the additional weight of the new deck, hatches, bulwarks, stern roller, and fishing gear, resulted in a lower loaded freeboard than when the vessel was employed lobster or scallop fishing. Because the new deck and fishhold flush hatch covers were not watertight the vessel was still essentially of open construction and, due to the lower effective loaded freeboard, more likely to ship and retain water.

From the deduced flooding sequence it would appear that

the loss of the "GARY & BURL" was brought about by downflooding and accumulated free-surface effects from seas shipped and retained onboard. The seas were initially shipped because of the severity of the weather and the vessel's relatively low effective freeboard as a result of a marked trim aft, and the downflooding was caused by the non-watertight construction of the fishhold flush hatch covers. In the event, the vessel did not retain sufficient transverse stability to withstand capsizing by the dynamic heeling forces imposed on her in the prevailing severe weather conditions.

While the seas reportedly shipped and retained onboard are considered to be the predominant factor in the loss of the vessel, it is also highly likely that her stability, freeboard and reserve buoyancy were also eroded by a simultaneous but unnoticed accumulation of bilge water resulting from the working of the hull structure, which could have been brought about by the stress of such severe conditions acting on the 20 years old wooden hull.

10. Weather forecasts and conditions prior to and at the time of the casualty

Marine weather forecasts issued by Environment Canada for the Maritime Region are broadcast on a regular scheduled basis from the Maritimes Weather Centre at 0045, 0530, 1130 and 1700 each day. Weather bulletins giving warning of substantial weather changes are also broadcast as and when necessary.

At 0005, Sunday, September 4, 1988, the following weather bulletin was broadcast regarding 19 Maritime marine areas, including Chaleur/Miscou:

> Attention fishermen and marine interests.
>
> An intensifying storm is expected to move northeastward along the St. Lawrence valley on Monday reaching western Labrador by evening. Gales are expected to spread into southwestern waters late Sunday night and reach all marine areas by Monday Afternoon.

The next regularly scheduled broadcast at 0045 included the following weather forecast for 4 marine areas, including Chaleur/Miscou:

> Gale warning issued.

Winds northwest 10 to 15 knots diminishing to light this morning.

Winds increasing to southeast 15 to 25 knots near midnight tonight and to southeast winds 25 to gale 35 Monday morning.

Rain and mist beginning Monday afternoon. Visibility fair in rain and mist. Little temperature change.

All of the ensuing regularly scheduled weather forecasts continued the gale warning for the Chaleur/Miscou area until that broadcast at 1700, Monday, September 5, 1988, which stated:

Gale warning ended.

Winds southwest 20 to 30 knots tonight and westerly 20 to 30 on Tuesday. Showers ending overnight. Visibility fair in showers.

Little temperature change. Outlook for Wednesday..... strong westerlies.

The next scheduled weather forecast was due to be broadcast at 0045, Tuesday September 6, and although high winds were forecast, many fishermen still sailed on Monday evening for the herring fishing grounds to the north of Miscou Island. At 2300, when the majority of the participating fleet was on the grounds and fishing, the following weather bulletin was broadcast covering six marine areas including Chaleur/Miscou:

Attention fisherman and marine interests.

A cold front in New Brunswick Monday evening will sweep through the Gulf of St. Lawrence tonight and then move east of the marine district on Tuesday. West or northwest gales are forecast in the Gulf waters as well as Fourchu and Cabot Strait tonight and Tuesday as cold air pushes in behind the front.

Details are available on the regular 12.45 AM. Marine forecast.

The regularly scheduled weather forecast broadcast at 0045, Tuesday, September 6, 1988, stated:

Gale warning issued.

> Winds southerly 10 to 25 knots increasing to westerly winds 25 to gales 35 before dawn today. Gales diminishing to southwest winds 15 to 25 after midnight. Southwest winds 15 to 25 on Wednesday. Showers ending this morning. Visibility fair in showers. Turning colder this morning.

Many fishermen confirmed the deterioration of the weather conditions shortly after midnight with the onset of heavy showers and a sudden increase in wind speed. The winds soon became gale force generally from the west, and, because of the fetch and relatively shallow water at the fishing grounds, the seas rapidly built up into short steep waves, estimated by experienced fishermen to be approximately 4.6 m high. These stormy conditions continued throughout the hours of darkness as the concentrated fleet dispersed, either to seek shelter to the east in the lee of Miscou Island, or to return to their home ports.

Gale warnings for the Chaleur/Miscou area were continued in all of the regularly scheduled broadcasts until 0045, Wednesday, September 7, which stated in part:

> Gale warning ended.
>
> Winds westerly 15 to 20 knots increasing to southwest 20 to 30 this morning. Winds diminishing to westerly 15 to 20 this evening. Winds westerly 20 to 30 on Thursday.

There is an automated meteorological station located on Miscou Island which, among other things, records hourly observations of the local wind speed and direction. The following relevant data was recorded on the evening of September 5, and morning of September 6, while the "GARY & BURL" was at the fishing grounds and attempting to return to port.

Date	ADST.	Wind Dir. (True).	Wind Speed (knots)	Wind Gusts (knots)
05.09.88	2100	180°	8	-
"	2200	200°	13	-
"	2300	210°	11	-
"	2400	250°	15	23

06.09.88	0100	270°	22	30
"	0200	270°	22	30
"	0300	270°	23	34
"	0400	260°	22	34
"	0500	270°	21	33
"	0600	250°	14	32
"	0700	260°	22	32
"	0800	270°	24	33
"	0900	260°	21	32
"	1000	250°	23	34
"	1100	260°	19	29

These local observations indicate the sudden deterioration of the weather conditions and show that the maximum wind speed and gusts occurred shortly after radio communication with the "GARY & BURL" ceased at approximately 0240. They also generally confirm the accuracy of the weather bulletin broadcast at 2300, September 5, and the regular scheduled forecast at 0045, September 6, 1988.

11. "GARY & BURL" - search and rescue efforts

At 0345, September 6, the CCG radio station at Rivière-au-Renard, P.Q., (VCG), received a report on VHF Channel 68 from the operator of the "LA BELLE BLONDE II" upon his arrival in Miscou harbour, outlining the casualty incurred by the "GARY & BURL". Shortly afterwards a similar re-iterative message clarifying the situation was received on the designated emergency Channel 16, from the CCGC "SHIPPEGAN". At 0420, having informed the Rescue Coordination Centre, Halifax, N.S. (RCC), a Mayday Relay was broadcast by VCG, and at 0435, 413 Squadron, CAFB Summerside, P.E.I. was notified.

Buffalo aircraft (R457) was alerted at 0435, airborne at 0535, and, having air-dropped an emergency pump to the distressed fishing vessel "NEW WAY" at 0621, while enroute, arrived on-scene, and identified and reported the location of the capsized hull of the "GARY & BURL" at 0717. The R457 while conducting a search for missing

crew members, reported the location of one body approximately 1 km to the north of the wrecked hull at 0850, and remained on-scene until 1010, before returning to base. The R457 resumed searching later in the day at 1745, and continued until poor light conditions curtailed operations at 1934. Buffalo aircraft (R455) arrived on-scene at 1145, and carried out an extensive but unsuccessful search until approximately 1500, returning to base at 1535.

The fisheries patrol vessel (F.P.V.) "LE QUEBECOIS" was alerted at 0420, sailed from Gaspé, P.Q. at 0445, and made her way through the severe weather conditions toward the herring fishing grounds off Miscou Island. Having ensured while enroute that the distressed fishing vessel "NEW WAY" was not in immediate danger of sinking and that another fishing vessel was standing-by her in case of need, the "LE QUEBECOIS" began searching at 0850 in the area where the "GARY & BURL" was last reported. She continued searching for the missing crew members, making several passes parallel to and approximately 2 miles off the western and northern shores of Miscou Island, until released from this duty at 2030, by RCC. The F.P.V. "LOUIS BÉRUBÉ", was alerted and sailed from Grande Rivière, P.Q., at 1110, arrived on-scene at 1610, and also conducted an unsuccessful search to within 1 to 1.5 miles of the shore in the area immediately to the north of the wrecked hull, until released at 1945, by RCC. In both instances the searching vessels encountered rough seas and heavy spray conditions and could not safely sail closer inshore.

Labrador helicopter (R304), arrived at 1206, made contact with the local RCMP attending the wreck scene and joined the air-search in coordination with Buffalo R455. The R304 was called from the scene at 1415, responding to another distress call and returned approximately 4 hours later at 1800. The search was resumed and at 1850, the R304 reported sighting the "NEW WAY", abandoned and adrift some 380 m off the west coast of Miscou Island, approximately 4 miles south of the wreck of the "GARY & BURL". Shortly afterwards the air-search was discontinued because of poor light conditions and the R304 returned to base at 1920.

The air-search was resumed at 0800, September 7, when the Labrador helicopter (R306) arrived on-scene and searched the beaches and high tide lines on the west and northern coasts of the island. At 0937, the R306 flew to Bonaventure, P.Q. to refuel, returned later in the afternoon at 1540, and continued searching until 1725,

at which time the search was curtailed and the aircraft returned to base. Relatives of the missing crew members were onboard during the last flight by the R306, and in view of its unsuccessful outcome, the air-search was abandoned and the casualty turned over to the RCMP as a missing persons case at 1730, September 7.

The CCGS "ALEXANDER MACKENZIE", alerted by RCC, sailed from Charlottetown, P.E.I. at 0940, September 6, to maintain SAR stand-by and also provide possible assistance for SAR helicopters operating off Miscou Island. She eventually returned to her regular base at Shippagan, N.B. on the evening of September 7.

Local residents and relatives of the missing crew members conducted an extensive search of the shore line of Miscou Island, which was maintained for several days after the casualty. The body of the operator was found on the beach near Northwest Miscou Point on September 11, and at the time of writing the report, the third member of the crew is still missing and is presumed to have drowned.

In summary, the SAR efforts specifically directed to this casualty involved two fixed-wing aircraft, two helicopters, two fisheries patrol vessels and one CCG vessel. It should be noted that these resources,- particularly the aircraft, were concurrently engaged responding to emergency situations reported by other small fishing vessels also adversely affected by the same severe weather conditions.

12. Search and rescue efforts, September 5 & 6.

Between 2000, September 5, and 1740, September 6, the CCG radio station at Rivière-au-Renard, P.Q., received 21 distress calls from fishing vessels seeking assistance, and broadcast 13 Mayday Relays directly related to the herring fishing fleet off Miscou Island. Two (2) of the distress calls proved to be false alarms or hoaxes, eight (8) were from disabled vessels which were eventually towed to safety by others nearby, nine (9) were from vessels either taking-on water, aground, or abandoned, and two (2) were from vessels taken in tow by the CCGC "SHIPPEGAN", prior to the onset of the most severe weather.

The CCGC "SHIPPEGAN", the dedicated SAR vessel based at Shippagan Harbour, N.B., sailed at 2020, September 5, in response to a distress call from the fishing vessel "DENIS CAROL", disabled due to transmission fa lure.

Having towed this vessel to Caraquet, N.B., the "SHIPPEGAN" responded to a call for assistance at 2200, from the fishing vessel "KARINE DENIS", disabled because of main engine failure, and while enroute, broadcast a message on VHF Channel 68, advising approximately 75 nearby fishing vessels of the approach of severe weather, and recommended that they curtail fishing and seek shelter to the east, in the lee of Miscou Island. (See Figure N° 2).

At 0134, September 6, while towing the "KARINE DENIS", a call for assistance was received from the fishing vessel "GERALD MARC", disabled and anchored in severe weather in position 48°03.37'N, 64°35.40'W. The tow was passed to another nearby fishing vessel, and at about 0345, as the "SHIPPEGAN" was proceeding toward the "GERALD MARC", she received and then relayed details of the casualty incurred by the "GARY & BURL", to the CCG radio station at Rivière-au-Renard. The "SHIPPEGAN" then responded to an urgent request from the fishing vessel "FUZZY", transferred an emergency pump, and subsequently arrived at the "GERALD MARC", took her in tow at about 0400, and headed for shelter at St. Marie-sur-Mer on the east coast of Miscou Island.

At approximately 0625, an emergency call from the fishing vessel "ANNICK G" indicated that while towing the disabled fishing vessel "ROSANNA", she had gone aground on the east coast of Miscou Island, and that the disabled vessel was anchored in heavy seas off-shore. The "SHIPPEGAN" having transferred an emergency pump to the "GERALD MARC", left that vessel safely at anchor in the lee of the land, and proceeded to assist the other two vessels. The "SHIPPEGAN" took the "ROSANNA" in tow, and upon the "ANNICK G" being refloated, passed the tow to her and returned to assist the "GERALD MARC", eventually arriving safety at St. Marie-sur-Mer at approximately 1040.

Shortly after 1200, an emergency call from a vessel reportedly off Pigeon Hill, was received by both the "SHIPPEGAN" and the CCG radio station at Rivière-aux-Renard, which, following extensive searches by that vessel and helicopter R304, off the east coast of Miscou Island, proved to be either a false alarm or a hoax.

In view of her activities off the east coast of Miscou Island, the "SHIPPEGAN" was unable to respond to the emergency situation involving the "GARY & BURL", and the subsequent search for missing crew members was conducted by aircraft and other SAR vessels.

13. Fishing fleet dispersal and ensuing events

The herring gill-netting fleet was concentrated in the relatively small area of preferred fishing ground to the north of Miscou Island, N.B. All of the 300 strong fleet were at risk and adversely affected by the sudden onset of the forecast severe weather conditions and many vessels were concurrently in need of and seeking assistance. Consequently, the initial and most timely responses were from other nearby fishing vessels which rendered mutual assistance.

The sudden onset of the westerly gale force winds and steep seas shortly after midnight caused the fleet to disperse and seek shelter. Some vessels, particularly those last to leave port, returned without having fished at all, many curtailed their fishing efforts, and several cut their nets free in order to seek shelter more quickly. A number of vessels dragged their fishing anchors, ran foul of others nearby and, in the dark and confusion, drifted to the east before gaining shelter in the lee of Miscou Island. Several vessels became disabled while seeking shelter as a result of net-fouled propellers, shaft couplings failure, or loss of engine power due to seawater or debris contaminated oil fuel. Many of the vessels exposed to the short steep seas regularly shipped water on deck, and because of flush non-watertight fishhold hatch covers, were subject to some downflooding. Generally those vessels with adequate bilge pumps and accessible pump suctions were able to cope with the flooding without resorting to portable gasoline pumps, enabling these to be passed to other vessels in imminent danger.

Timely assistance was rendered by nearby fishing vessels towing those that became disabled, or by taking onboard the crews of heavily flooded vessels as they were abandoned. Several boats which had found shelter in the lee of Miscou Island later ran aground while approaching harbours by way of unfamiliar eastern entrances, but did not incur serious damage.

The precise details of the fleet's dispersal cannot be established, however, it is estimated that approximately 80 vessels, many of whom had either dragged anchor and drifted or had been fishing to the northeast of Miscou Island before the onset of the gale force winds, eventually found shelter in its lee.

Reportedly some 25 to 30 vessels sailed slowly to the west-northwest, heading into heavy seas while making

toward their home ports in the Gaspé area.

The remainder of the fleet generally comprised of vessels whose home ports were to the west of or on the south shore of Miscou Island, were more exposed to beam and quartering winds and seas as they made their way in a southwesterly direction. These latter vessels, which included the "GARY & BURL", generally experienced more severe conditions, shipped more seas and also had to contend with the added hazard of being on a lee shore.

As the sequence of events which culminated in the loss of the "GARY & BURL" was taking place, a number of other nearby fishing vessels were affected by the severe weather conditions and also called for assistance. A clearer perspective of the confused situation on the west coast of Miscou Island may be had from a brief review of concurrent casualties which, with the exception of the "LADY LISA", were not directly involved with the loss of the "GARY & BURL", but had a bearing on the ensuing search and rescue efforts.

14. F.V. "LADY LISA": engine failure and grounding

The "LADY LISA", with 3 persons onboard sailed from Miscou Harbour at 2030, September 5, 1988, arrived at the fishing grounds off Northwest Miscou Point at approximately 2300, and shortly after midnight as the weather worsened, decided to return to port without attempting to fish. The vessel proceeded in a southwesterly direction generally parallel to and approximately 2.5 miles off the west coast of Miscou Island, encountering west-northwesterly winds of 30 knots and waves estimated to be 4.6 m in height. While near Miscou Flat buoy, main engine power was lost and the oil fuel filters were found to be choked with rust and debris from the fuel tanks, apparently loosened by the motion of the vessel in the rough weather conditions. Attempts to clear the filters and fuel lines were unsuccessful, and the disabled vessel was driven by the wind toward the shore. Despite initially deploying a stocked anchor of 68 kg and later the vessel's spare fishing anchor of 52 kg, the vessel was eventually driven ashore in position 47°56.04'N, 64°35.51'W.

While attempting to anchor, the crew did not don lifejackets, no radio calls for assistance were made, no distress flares were fired and no other fishing vessels were sighted. Despite the rough seas close inshore, the vessel grounded on a gently sloping sandy beach with no significant damage, and at 0304 September 6, the CCG

radio station at Rivière-au-Renard, P.Q. was contacted and informed that no immediate assistance was needed.

The vessel remained aground until 0400, September 10, when she was refloated with assistance from "SHIPPEGAN" and towed to Shippagan Harbour. (See Photograph N° 5).

It should be noted that the time and location of the engine failure and subsequent drift of the "LADY LISA", place her very close to the scene of the "GARY & BURL" casualty, however neither she or the "BABY DOLL IV" were sighted.

15. **F.V. "NEW WAY": abandonment and loss**

The "NEW WAY" with three persons onboard sailed from Caraquet, N.B. at 1600, September 5, 1988, bound for fishing grounds to the north of Miscou Island, and at about 2200, having caught 80 barrels of herring, decided to return to port. The weather conditions deteriorated and speed was reduced as she headed for Caraquet. At about 0200, September 6, in westerly winds of up to 35 knots and waves estimated to be 4.6 m high, floodwater was discovered in the bilges of the forward crew cabin, and shortly afterwards in the engine room. The vessel was frequently shipping seas on deck, however the main source of the flooding was found to be below the waterline near the forefoot.

The vessel was equipped with three pumps, all of which were utilised to help clear the bilges, but the ingress of water continued and began to slowly gain on the clearing efforts. A Mayday distress call was broadcast on VHF Channel 16, at about 0545, when the vessel was some 3 miles east of Caraquet. A Buffalo aircraft (R457) from CFB Summerside, P.E.I., alerted and airborne in response to the "GARY & BURL" casualty, was diverted enroute and air-dropped an emergency pump. The pump was retrieved by the crew of the "NEW WAY", but it could not be started, the flooding continued, and the vessel started to drift toward shore under the influence of the high seas and strong westerly wind. The F.P.V. "LE QUEBECOIS" arrived on scene, having sailed from Gaspé, P.Q. at 0445, in response to a number of emergency calls, but was unable to approach the "NEW WAY" because of shallow water.

At about 0655, the "NEW WAY" was taken in tow by the fishing vessel "PASCAL G" which had sailed from Caraquet in response to a CB radio message from the "NEW WAY". The vessel continued to settle deeper in the water due to the flooding, and at approximately 0720, the crew

transferred to the "PASCAL G", and the "NEW WAY" was abandoned in position 47°52.83'N, 64°47.49'W. The "PASCAL G" returned to Caraquet with the survivors and the "NEW WAY" eventually drifted ashore on the west coast of Miscou Island. (See Photograph N° 6).

The water-logged hull, having pounded on the beach while aground, was hauled out after the bad weather subsided, surveyed on shore, and declared a total loss, her estimated value being $80,000.

16. **F.V. "HUGUETTE-SONIA": abandonment and salvage**

The "HUGUETTE-SONIA", with 3 persons onboard, sailed from Caraquet, N.B. at 1600, September 5, 1988, arrived at the fishing grounds to the north of Miscou Island at 1830, and stopped fishing at about 2400, when the hold was filled with 70 barrels of herring. During the return voyage to Caraquet the weather deteriorated and the vessel slowed down as she encountered westerly winds reported to be 40 knots, and waves estimated to be 3.7 m high.

The vessel frequently shipped and retained seas on deck, and downflooding through the flush fitting fishhold hatch covers in the weather deck, accumulated in the fishhold and engine room bilges. The vessel's pumps were utilised but the flooding slowly gained and a distress radio call was made on VHF Channel 68. Shortly afterwards, the main engine stopped and buckets were used to help bail out the floodwater. The "HUGUETTE-SONIA" was anchored to prevent her drifting into shallow water and grounding, and at approximately 0600, the fishing vessel "TAMMY DAWN", standing-by in response to the radio distress message, came alongside and the crew abandoned the disabled vessel. The "TAMMY DAWN" then sailed to Caraquet and landed the survivors at approximately 0800, September 6.

The abandoned "HUGUETTE-SONIA" did not founder but remained at anchor, and when the weather moderated the crew returned to effect salvage. With the CCGS "ALEXANDER MACKENZIE" standing-by and pumps and assistance from the "SHIPPEGAN", the disabled vessel was pumped out and towed to Shippagan Harbour, arriving at 1830, September 7.

17. **F.V. "FUZZY": main engine failure**

The "FUZZY", with 5 persons onboard sailed from Shippagan, N.B. at 1900, September 5, 1988, bound for

herring fishing grounds to the northeast of Miscou Island. By about 2300, 57 barrels of herring had been caught, but because the weather was deteriorating, it was decided to return to port with less than the maximum landing allowance of 80 barrels. At about 2345, the main engine stopped and examination showed that the oil fuel filters were filled with seawater. While the oil fuel system was being cleared the "FUZZY" was set to the east of Miscou Island by the strong westerly wind of approximately 25 knots, and the vessel shipped and retained water on deck. The engine was restarted but ran for only 15 to 20 minutes, when it again stopped due to the same cause. This cycle was repeated several times as the source of the seawater contamination could not be found. Shipped water taken on deck when the vessel was disabled accumulated in the bilges each time power for the ship's pumps was lost.

A portable gasoline engine driven pump was received following a radioed request to the nearby "SHIPPEGAN", and the bilge flooding was brought under control. At approximately 0300, the fishing vessel "EDITH & DIANE" took the "FUZZY" in tow and slowly headed toward Shippagan. The main engine of the "FUZZY" continued to run intermittently while still under tow, and both vessels eventually arrived in port at 1530.

In-port examination showed that the open end of the air vent pipe from the vessel's oil fuel tank was located above deck but passed through the transom bulwark exposing it to heavy following seas, so allowing seawater to enter the fuel tank.

18. <u>Inshore herring fishing fleet, Zone 16B</u>

Of the approximately 1000 current holders of gill-net fishing licences in Zone 16B, some 490 to 510 regularly participate in the Baie des Chaleurs herring-roe fishery off Miscou Island, and at the height of the season the active inshore fleet averages 480 to 500 vessels each night.

Because of the gale warning in effect on Sunday, September 4, many herring fishermen did not venture to sea, however in view of the ending of the gale warning at 1700, Monday, September 5, and in the light to moderate winds experienced locally, more were induced to go fishing that night, despite the current weather forecast for high winds barely below gale force. The fleet sailed from several local harbours, at first a few left at about 1730, and thereafter in increasing numbers

until approximately 2130.

The number of gill-net fishing vessels leaving each harbour is not recorded and, because of the confusion caused by the dispersal of the fleet in the gale conditions and some vessels returning empty, not having set their nets, the total number of vessels caught at sea in the stormy conditions cannot be determined from the usual catch landings records. However, estimates by several experienced local fishermen and observations of fisheries personnel and fish plant operators indicate that approximately 280 to 300 vessels were involved.

19. **Seaworthiness of the herring gill-netting fleet**

The "GARY & BURL" was typical of the many small fishing vessels employed gill-netting for herring in the Baie des Chaleurs, and the structural features which most likely contributed to her loss are also evident to a greater or lesser extent in a large number of the current fleet. Consequently, by reviewing this casualty together with those incurred by similar vessels in the same stormy conditions, a clearer perspective of the overall safety status of the fleet may be obtained by highlighting those features which give most cause for concern.

Any small fishing vessel of open or closed construction employed in exposed waters is operated at some risk, being particularly vulnerable to shipping seas over the gunwale or on deck, and prudent operation with regard to loading, trim, handling and weather is essential for safety. Observations in several local harbours showed that the majority of the inshore herring gill-netting fleet is comprised of small wooden fishing vessels of less than 15 GRT, and that a number of structural features are commonly adopted which adversely affect their safety and seaworthiness.

The fishhold hatches arranged on the weather decks of the majority of vessels have either very small or no coamings and are equipped with unsecured non-watertight flush fitting wooden covers; consequently they do not prevent downflooding in the event of water being shipped on deck. In some instances the flush hatch covers comprise a large proportion of the weather deck area, exposing the vessel to further downflooding when, of necessity, they are opened at sea to stow the fish catch. Furthermore, being unsecured, the covers are vulnerable to being swept away by shipped seas or dislodged by upward pressure from nearly full holds of

bulk herring disturbed by the motion of the vessel in rough weather. (See Photographs Nos 7 and 8).

The majority of vessels are arranged with substantial bulwarks approximately 400 to 450 mm in height, which extend around the perimeter of the working deck. In most cases the bulwarks are not provided with freeing-ports of sufficient area to permit the rapid clearing of shipped water from the deck, and on some vessels the bulwarks are completely intact. (See Photograph No. 9). Consequently, any shipped water would be retained on deck before either draining overboard or finding its way below deck through non-watertight flush hatch covers, during which time the vessel's stability would be adversely affected by the weight of the water and its free-surface effect.

In general, few fishermen understand free-surface effect and fewer appreciate the substantial reduction of transverse stability brought about when water, even a few inches, is shipped and retained on deck or is allowed to accumulate in underdeck compartments. A vessel's transverse stability is adversely affected because the presence of any liquid or fish which is free to flow to port and starboard causes a virtual rise of the vessel's centre of gravity. The combined free-surface effects in conjunction with the sudden reduction of effective waterplane area when the deck edge or gunwale is immersed can be disastrous, particularly when the vessel is also subjected to dynamic heeling effects in confused and high waves.

Although no trace of any portable fishhold divisions or their securing channels was found in the beached hull of the "GARY & BURL", they were reportedly in place on departure. However, post-casualty inspection of a number of other vessels showed that their installation is not universal throughout the fleet. (See Photograph No. 10). The omission of hold pen-board divisions when carrying herring in bulk has often led to serious casualties and capsizings, and it should be noted that a small vessel's stability can be quickly lost due to a sudden athwartships shift of fish, particularly when the hold is partially full.

An unrecorded number of vessels were disabled during the severe weather conditions as a result of having lost main engine power from various causes, and only timely assistance from nearby vessels prevented more serious casualties developing. Reportedly, main engine break-down was due to either seawater contaminated fuel, or

fuel lines and filters choked by rust and other debris disturbed by the vessels' violent motion. The entry of seawater into oil fuel tanks was generally attributable to the exposed location of air vent-pipes, and fuel debris contamination to infrequent fuel tank cleaning. In some instances the location of air vent pipes, fuel filters and lines, prevented immediate location of the blockage or remedial action being taken at sea.

Access to the lazaret and steering gear on many vessels is only possible by way of portable panels in the transverse bulkhead dividing it from the fishhold. Consequently, once herring are loaded, any steering gear fault which develops cannot be rectified at sea and control of the vessel is lost. In this regard, few vessels are fitted with a secured deck plug in way of the rudder stock to facilitate the rigging of emergency tiller steering from above deck.

The provision of weather deck minimum coaming heights; the security of hatch covers; minimum bulwark freeing-port areas; the installation of fishhold divisions and the maintenance of adequate stability, together with many other safety related features are specifically addressed by the regulatory requirements for small fishing vessels over 15 GRT. Because the majority of the herring gill-netting fleet is less than 15 GRT, the regulatory requirements are not applicable, nor are the vessels subject to mandatory quadrennial inspection by the Ship Safety Branch of Canadian Coast Guard. However, although these regulatory requirements are not applicable, they do represent minimum standards which are equally appropriate to the smaller vessels which are, in fact, more susceptible to the effects of rough weather than their larger sisters. Furthermore, responsibility for the safety of any vessel always rests with the operator, who should understand the basic principles of stability, ensure that the vessel is maintained in a seaworthy condition, and operate the vessel in a seamanlike manner. In this regard, the Small Fishing Vessel Inspection Regulations are presently the subject of revision and upon completion will incorporate additional requirements specifically addressing the construction and arrangement of vessels under 15 GRT.

Currently, a number of informative pamphlets specifically addressing these subjects are published for the guidance of uncertificated operators of small fishing vessels, details of which are included elsewhere in this report.

20. 1988 Herring gill-netting season, Baie des Chaleurs Zone 16B

In accordance with the 1988 Management Plan of the Department of Fisheries and Oceans, the herring-roe fishing season was scheduled to open at noon, August 21, 1988. Selection of the opening date, which was 10 days later than that of the 1987 season, was dictated primarily by biological and herring resource management considerations. No specific closing date was set because fishing is stopped as soon as the total quota is taken, or ends naturally when the abundance of herring and herring-roe quality decline.

The 1988 herring catch quota of some 28,500 mt, plus an additional 854 mt, for bait, was not significantly different to that of the 1987 season, however, because of dissatisfaction with the pricing scale per barrel of fish offered by the herring-roe buyers, the herring fishermen decided at a meeting held on August 20, not to go fishing until better payment terms were agreed upon. Subsequently on September 3, after a series of meetings, the majority of local inshore fishermen holding herring fishing licences decided to commence gill-netting from noon the following day. While it was significantly lower than that paid during the 1987 herring season, the original basic price per barrel offered for 1988 remained unchanged, and although it was subject to progressive increases dependent upon herring-roe percentage yield and quality, the average price per barrel was still likely to be lower than previous years.

Because of the later opening date and the delay caused by the extended fishermen's dispute, herring gill-netting did not actually start until September 4, some 24 days later than in 1987. Consequently most of the inshore herring fishermen were under some economic pressure to start fishing as soon as possible whilst the herring remained in their area and the herring-roe yield was most advantageous. Some fishermen were induced to sail on Sunday September 4, despite a gale warning being in effect for the area, and many more sailed on the evening of September 5, in the face of a forecast for high winds barely below gale force which, at 2300, was upgraded to yet another gale warning.

It should be noted that following the official opening of the herring gill-netting season on August 10, 1987, the total quota of some 28,000 mt was caught by September 15. In 1988, following the later official season opening and delay due to the fishermens' pricing

dispute, gill-netting did not actually start until September 4, and that recorded landings totalled only 22,000 mt by October 11, after which time little or no gill-netting was practiced.

21. Radio License

Under the Ship Station Radio Regulations made pursuant to the Canada Shipping Act, the "GARY & BURL" was not required to be equipped with a VHF R/T installation. However, because one was fitted, the radio station was required to be properly licensed and the operator to hold a Radiotelephone Operator's Restricted Certificate (Marine) (RORC) under the General Radio Regulations made pursuant to the Radio Act.

In this instance, the VHF radio station was not licensed and none of the crew of the "GARY & BURL" held a RORC.

22. Cold water survival

The Cold Water Survival Chart (See Figure N° 3), taken from a pamphlet by the Canadian Red Cross Society, shows that the average person immersed in seawater of approximately 17°C, without protective clothing, as was the case during the casualty of the "GARY & BURL", would have a strong possibility of survival if rescued within four and one half hours of immersion. After four and a half hours average persons have a 50% chance of survival, but would be weak and generally unable to help themselves, and after six hours of immersion, the chances of survival are slim.

These average times are based upon persons wearing a lifejacket and remaining still while immersed and it is likely these times would have been considerably reduced by any strenuous body movement and stress induced by the prevailing heavy seas and high wind conditions.

Autopsies attributed the deaths of the two recovered victims to drowning and it is presumed that the third person, missing since the loss of the "GARY & BURL", also died from a similar cause.

23. Publications

The "Safety Handbook for the Inshore Fisherman". (TP 5859E), the "Manual of Safety and Health for Fishermen" (TP 1283E), and "An Introduction to Fishing Vessel Stability" (TP 8161E), are booklets published by the Canadian Coast Guard especially for fishermen. These

booklets contain practical advice on navigation, stability, safety, radio communications, weather information, and equipment required and recommended for fishing vessels; many of the comments and suggestions have been developed as a result of accidents occurring over the years in the fishing industry.

In order to promote and improve fishing safety, Chapter 1 - General Provisions of TP 1283E defines the purpose and scope of the manual as:

> 1.1.1 The purpose of this publication is to provide information with a view to promoting the safety and health of fishermen.
>
> 1.1.2 It may also serve as a guide to those concerned with framing measures for the improvement of safety and health on board fishing vessels but is not a substitute for existing laws and regulations.
>
> 1.1.3 Its scope is limited to information necessary for safe working and fishing conditions on board.

and the section on 'Stability' is limited to the following:

> 3.5.1 Skippers and mates should understand the basic principles of stability.

The basic principles regarding stability are clearly described in TP 8161E, and in the opening pages states:

> This booklet is not intended to be a complete course of study in fishing vessel stability, but an introduction to it.

The contents of TP 5859E, developed by the Search and Rescue Branch of the Canadian Coast Guard, include illustrated lists of required and recommended safety equipment for small fishing vessels, and the paragraph entitled "What you need on your fishing vessel", on page 2, states in part:

> Information in this guide applies primarily to commercial fishing vessels not exceeding 15 tons gross tonnage that are not subject to

regulatory inspections by the Ship Safety Branch, Canadian Coast Guard. The Manual of Safety and Health for Fishermen (TP 1283 is available, from the Coast Guard, for those fishing vessels that are subject to regulatory inspections.

This guide details the equipment required under the Small Fishing Vessel Inspection Regulations and the International Regulations for the Prevention of Collision at Sea ('Collision Regulations').

The Coast Guard will, on request, conduct a Courtesy Examination of safety equipment on your vessel. This examination is free of charge. PLEASE CONTACT THE NEAREST COAST GUARD OFFICE.

24. Qualifications and experience of the crew

The operator of the "GARY & BURL" held no formal marine qualification nor was he required to by regulation. He had 19 years local fishing experience having been employed as a fisherman since he was 16 years of age, and had owned and operated the "GARY & BURL" since 1981.

One of the missing crew members had 5 years and the other 2 years fishing experience and neither held any formal marine qualification, nor were they required to by regulation.

Findings

The Canadian small fishing vessel "GARY & BURL", having taken-on water while returning to port in severe weather conditions, capsized off the west coast of Miscou Island, N.B. during the early hours of September 6, 1988, with the loss of her crew of 3. She subsequently drifted ashore and was wrecked in position 47°58.36'N, 64°32.52'W.

It would appear that the following factors contributed to the casualty:

- the severity and suddenness of the onset of high winds and seas, the strong winds having been forecast;

- the vessel's loading and consequent low effective after freeboard;

- the non-weathertight construction of the weather deck and fishhold hatch covers;

- the lack of coamings and securing devices for the flush fitting hatch covers;

- the inadequate area of freeing ports in the bulwarks, and

- downflooding into the hull by water shipped on deck which caused main engine and electrical power failure, lowered the effective freeboard and reserve buoyancy, and reduced the transverse stability.

It would also appear that the following factors contributed to the lives being lost:

- the vessel capsized at night in severe weather conditions.

Other findings

The later scheduled official opening of the herring gill-netting season and the further delay due to a herring-roe price dispute, caused many fisherman to be under some financial pressure, and consequently they were induced to commence fishing at the first opportunity, despite an adverse weather forecast.

The "GARY & BURL", together with some 300 other small fishing vessels sailed in the face of a forecast of strong winds, subsequently proven correct, which was later upgraded to a gale warning while the fleet was on the fishing grounds.

The initial distress call from the "GARY & BURL" was not transmitted on the designated emergency VHF Channel 16, however, the earliest possible response was made by nearby fishing vessels which habitually employ CB radio as their primary and preferred means of communication.

The VHF radio station was not licensed and none of the crew of the "GARY & BURL" held a RORC.

Once alerted, SAR services responded promptly to this casualty and the many concurrent emergency calls received from the endangered and dispersed fleet of some 300 vessels.

The majority of the inshore herring gill-netting fleet

is comprised of vessels of less than 15 GRT, which are not subject to mandatory hull inspection by the Ship Safety Branch of CCG. The fleet's natural evolution has led to the adoption of a number of constructional features, selected for economy and convenience which, in adverse weather conditions, significantly affect vessel safety and seaworthiness.

The operator and one of the crew members did not don approved lifejackets which were onboard the vessel.

Had the vessel carried thermal work suits or immersion suits and these had been worn, the victims chances of survival would have been increased.

MARINE CASUALTY INVESTIGATIONS
TRANSPORT CANADA
110 O'CONNOR
OTTAWA, ONTARIO
K1A 0N5

MAY 1989

Glossary

Bulkhead	Any vertical division separating the hull into in dividual compartments.
Bulwark	An extention of the vessel's side planking above weather deck level.
CCG	Canadian Coast Guard.
CCGC	Canadian Coast Guard Cutter.
Coaming	In this context, the above deck structure surrounding a hatch opening.
Down-flooding	In this context, means seawater entering the vessel's hull by way of non-watertight hatches and decks.
EPIRB	Emergency position indicating radio beacon. A transmitting device whose signal may be received by SAR craft or orbiting satelite, indicating the position of a vessel in need of assistance.
Frames	In this context, the wooden 'ribs' supporting the hull planking.
Freeing-port	An opening in the bulwarks close to the deck, intended to allow shipped water to flow overboard.
Free-surface effect	The reduction of a vessel's transverse stability due to a virtual rise of the centre of gravity, brought about whenever a surface of liquid onboard is free to flow to port and starboard.
GRT	Gross Registered Tonnage.
Hooded-ends	The overlapped end fastenings of the hull planking at the stem and sternposts.

Lazaret	The aftermost compartment, usually housing the steering gear.
MAYDAY RELAY	A distress signal repeated by a station other than the station in distress.
MAYDAY	International radio distress signal used by ships seeking help.
RCC	Rescue Coordination Centre.
SAR	Search and rescue.
Shipped water	In this context, means relatively large amounts of water taken on deck in stormy conditions.
Stability	The ability of a vessel to return to the upright when heeled by some outside force.
Stempost	The upright wooden member at the vessel's stem.
Sternpost	The upright wooden member at the vessel's stern.
Transom	The area of hull planking accross the vessel's stern.
UTC	Coordinaed Universal Time.
VHF	Very high frequency.

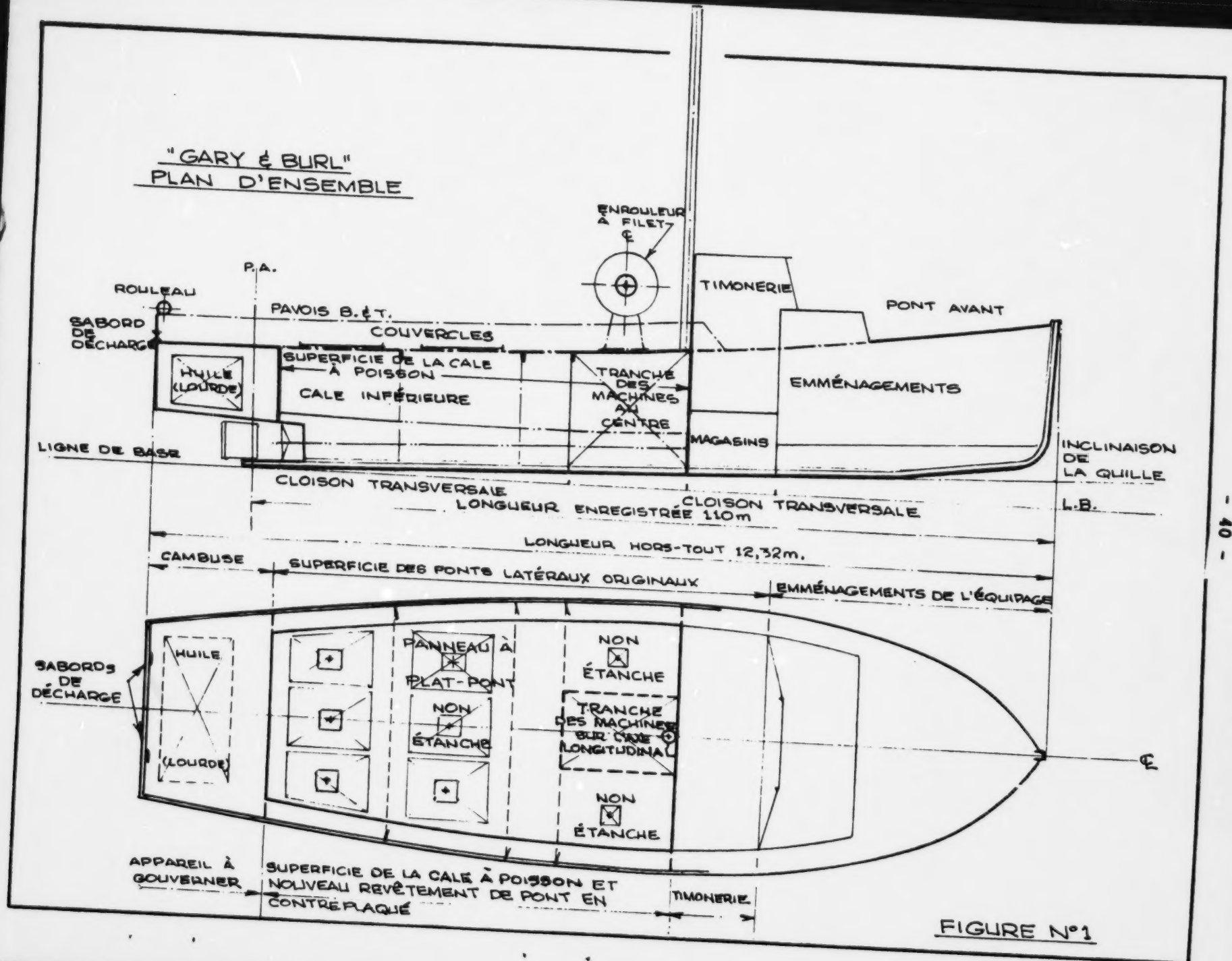
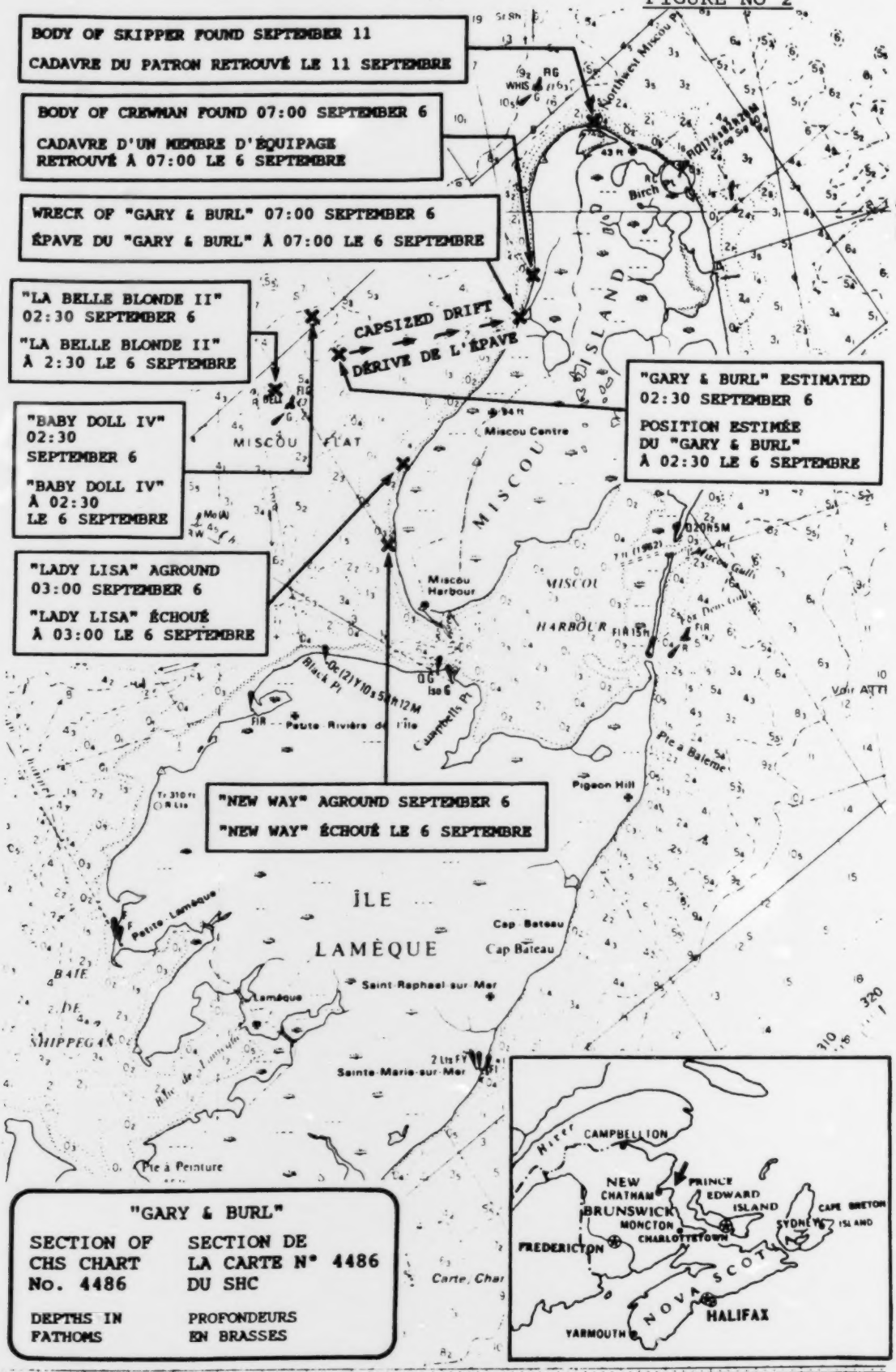

"GARY & BURL"
PLAN D'ENSEMBLE
ENROULEUR À FILET
P.A.
ROULEAU
PAVOIS B. & T.
SABORD DE DÉCHARGE
COUVERCLES
TIMONERIE
PONT AVANT
HUILE (LOURDE)
SUPERFICIE DE LA CALE À POISSON
CALE INFÉRIEURE
TRANCHE DES MACHINES AU CENTRE
EMMÉNAGEMENTS
MAGASINS
LIGNE DE BASE
INCLINAISON DE LA QUILLE
CLOISON TRANSVERSALE
LONGUEUR ENREGISTRÉE 11.0m
CLOISON TRANSVERSALE
L.B.
LONGUEUR HORS-TOUT 12,32m.
CAMBUSE
SUPERFICIE DES PONTS LATÉRAUX ORIGINAUX
EMMÉNAGEMENTS DE L'ÉQUIPAGE
SABORDS DE DÉCHARGE
HUILE
(LOURDE)
PANNEAU À PLAT-PONT
NON ÉTANCHE
NON ÉTANCHE
TRANCHE DES MACHINES SUR CAISSE LONGITUDINALE
NON ÉTANCHE
APPAREIL À GOUVERNER
SUPERFICIE DE LA CALE À POISSON ET NOUVEAU REVÊTEMENT DE PONT EN CONTREPLAQUÉ
TIMONERIE

FIGURE N°1

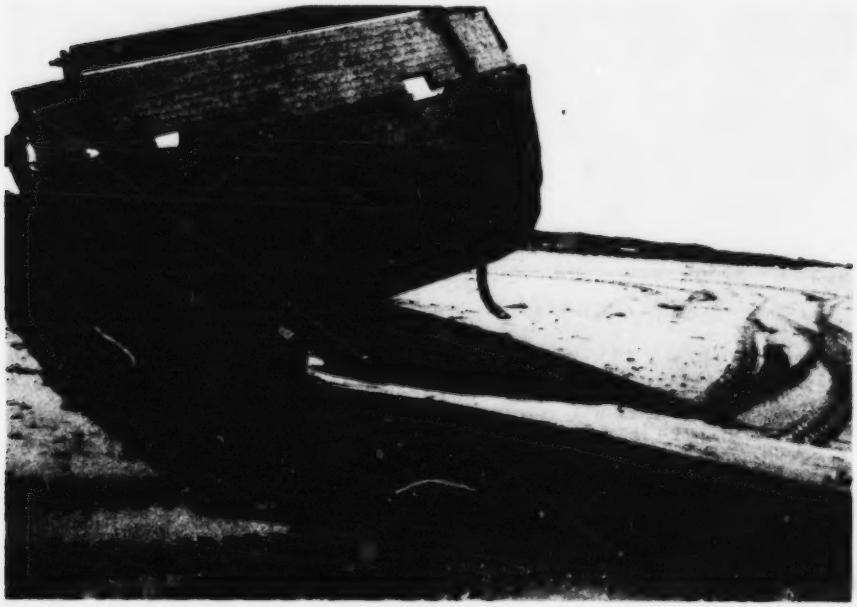
FIGURE No 2


BODY OF SKIPPER FOUND SEPTEMBER 11
CADAVRE DU PATRON RETROUVÉ LE 11 SEPTEMBRE
BODY OF CREWMAN FOUND 07:00 SEPTEMBER 6
CADAVRE D'UN MEMBRE D'ÉQUIPAGE RETROUVÉ À 07:00 LE 6 SEPTEMBRE
WRECK OF "GARY & BURL" 07:00 SEPTEMBER 6
ÉPAVE DU "GARY & BURL" À 07:00 LE 6 SEPTEMBRE
"LA BELLE BLONDE II" 02:30 SEPTEMBER 6
"LA BELLE BLONDE II" À 2:30 LE 6 SEPTEMBRE
"BABY DOLL IV" 02:30 SEPTEMBER 6
"BABY DOLL IV" À 02:30 LE 6 SEPTEMBRE
"LADY LISA" AGROUND 03:00 SEPTEMBER 6
"LADY LISA" ÉCHOUÉ À 03:00 LE 6 SEPTEMBRE
CAPSIZED DRIFT
DÉRIVE DE L'ÉPAVE
"GARY & BURL" ESTIMATED 02:30 SEPTEMBER 6
POSITION ESTIMÉE DU "GARY & BURL" À 02:30 LE 6 SEPTEMBRE
"NEW WAY" AGROUND SEPTEMBER 6
"NEW WAY" ÉCHOUÉ LE 6 SEPTEMBRE
MISCOU ISLAND
MISCOU HARBOUR
ÎLE LAMÈQUE
Miscou Centre
Miscou Harbour
Pointe Rivière du Nord
Pointe Rivière de l'Île
Petite Lamèque
Lamèque
Saint-Raphael-sur-Mer
Sainte-Marie-sur-Mer
Cap Bateau
Pigeon Hill
Pte à Peinture
Pte à Balerne
Northwest Miscou Pt
Birch
Black Pt
Campbells Pt
Marion Gulch
Dunes Lagoon
48° 00' N
64° 40 W
"GARY & BURL"
SECTION OF CHS CHART No. 4486
SECTION DE LA CARTE N° 4486 DU SHC
DEPTHS IN FATHOMS
PROFONDEURS EN BRASSES
CAMPBELLTON
NEW BRUNSWICK
CHATHAM
MONCTON
PRINCE EDWARD ISLAND
CHARLOTTETOWN
SYDNEY
CAPE BRETON ISLAND
FREDERICTON
NOVA SCOTIA
HALIFAX
YARMOUTH
Carte adjacente
Adjoining Chart 4024

Photograph No. 1 Photographie N° 1

Beached hull of F.V. "GARY & BURL",
west coast of Miscou Island, N.B.

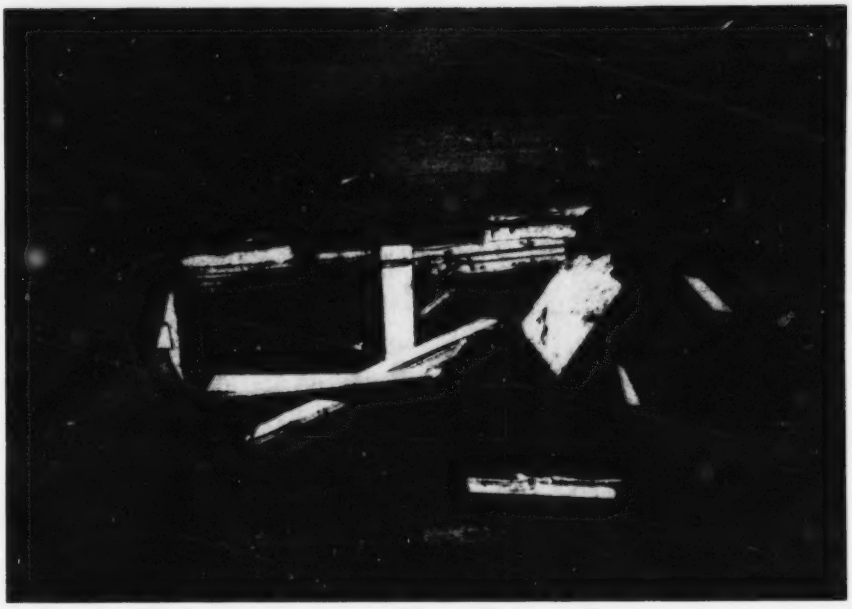
Coque échouée du B.P. "GARY & BURL" sur
la côte Ouest de Miscou Island, N.-B.



Photograph No. 2 Photographie N° 2

View of intact transom of beached hull
of F.V. "GARY & BURL".

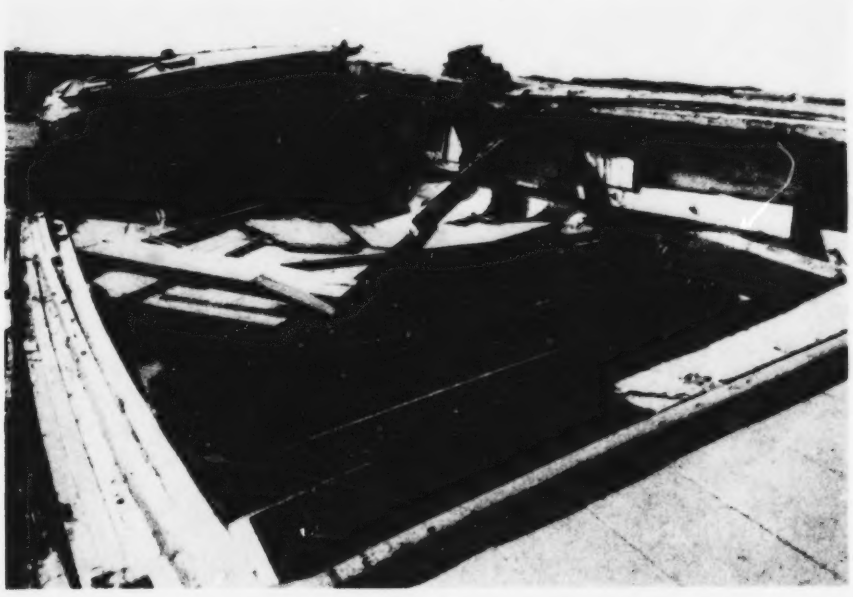
Vue du tableau arrière intact de la
coque échouée du B.P. "GARY & BURL".



Photograph No. 3 Photographie N° 3

Wrecked hull of F.V. "GARY & BURL",
looking toward stern.

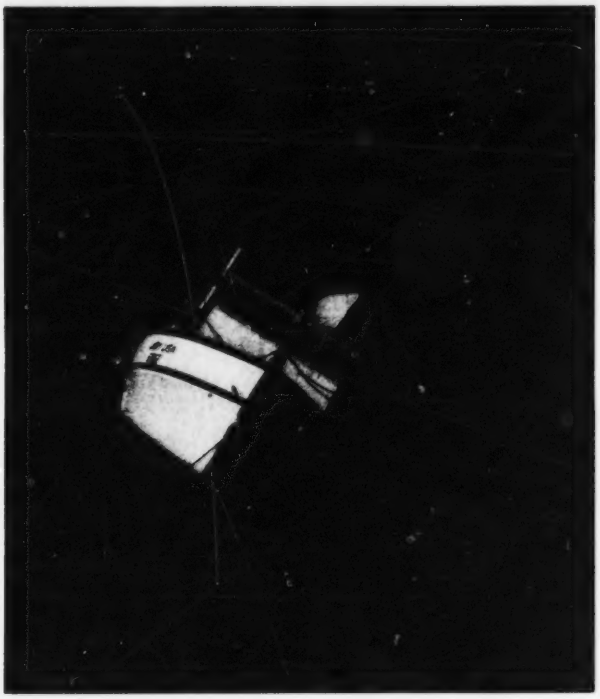
Coque avariée du B.P. "GARY & BURL",
vue de l'arrière.



Photograph No. 4 Photographie N° 4

Wrecked hull of F.V. "GARY & BURL",
looking toward bow.

Coque avariée du B.P. "GARY & BURL",
vue de l'avant.



Photograph No. 5 Photographie N° 5

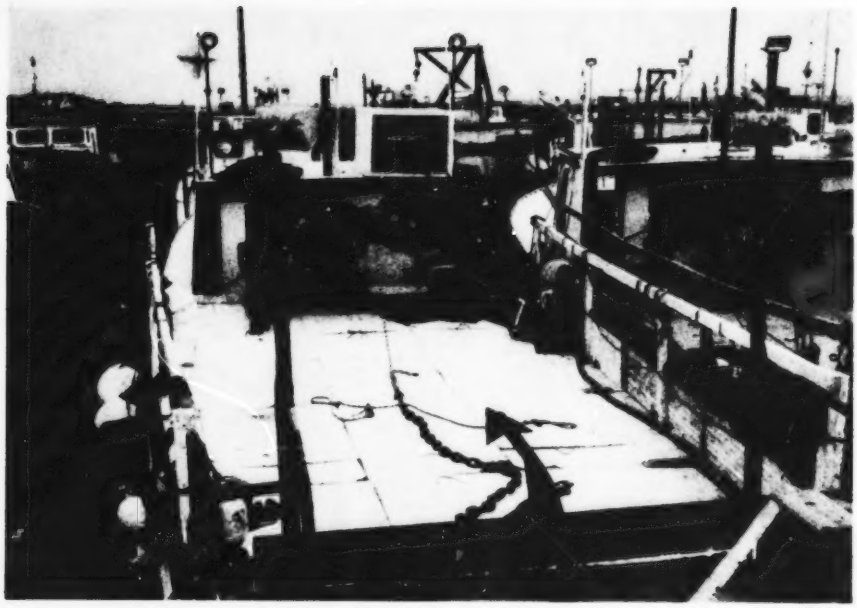
F.V. "LADY LISA", aground west coast of Miscou Island, N.B.

B.P. "LADY LISA" - Échoué sur la côte Ouest de Miscou Island, N.-B.

Photograph No. 6 Photographie N° 6

F.V. "NEW WAY", aground west coast of Miscou Island, N.B.

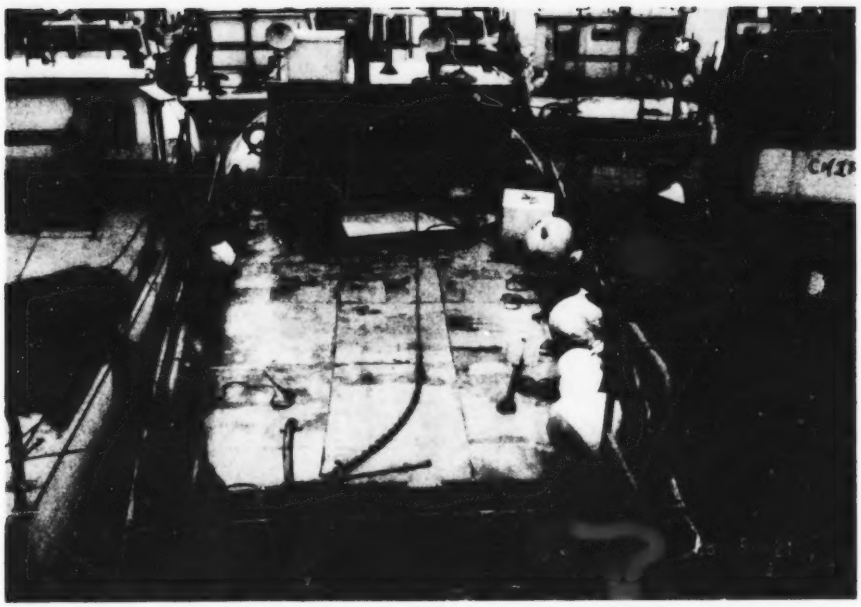
B.P. "NEW WAY" - Échoué sur la côte Ouest de Miscou Island, N.-B.



Photograph No. 7 Photographie N° 7

Typical herring gill-netter, showing extent of flush hatch covers on weather deck, and inadequate bulwark freeing-ports.

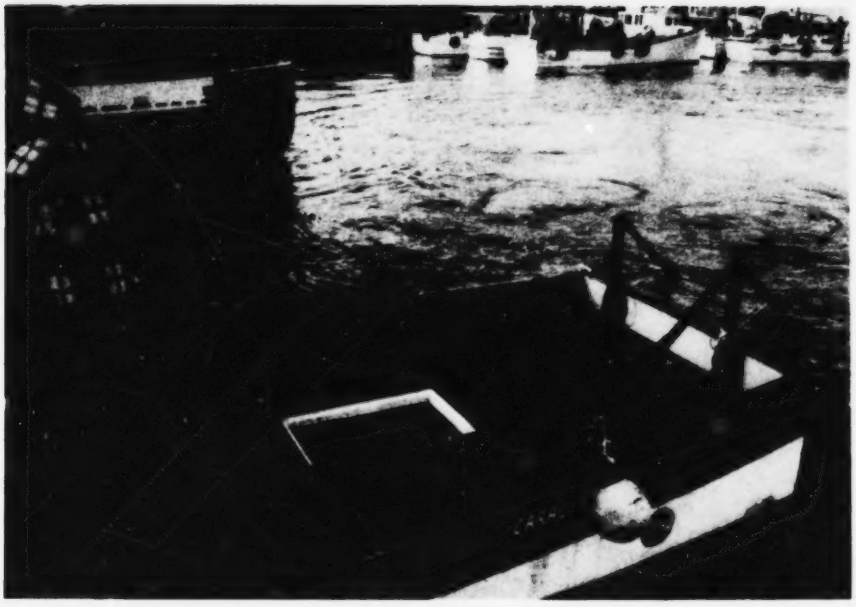
Bateau typique pour la pêche du hareng aux filets maillants montrant la superficie des couvercles à ras de l'écoutille sur le pont à découvert et les sabords de décharge de pavois inadéquats.



Photograph No. 8 Photographie N° 8

Typical herring gill-netter, showing extent of flush unsecured plywood hatch covers on weather deck, and no freeing-ports.

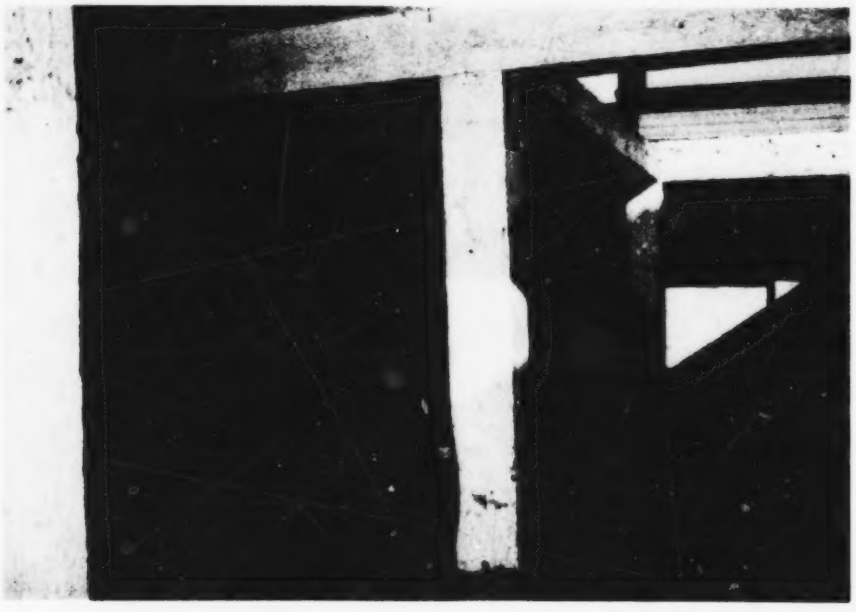
Bateau typique pour la pêche du hareng aux filets maillants montrant la superficie des couvercles à ras de l'écoutille non fixée sur le pont à découvert et sans sabord de décharge.



Photograph 9 Photographie N° 9

Typical flush fish-hold hatch with no coaming, and no bulwark freeing ports

Écoutille à ras typique de la cale à poisson sans surbeau ni sabords de décharge au pavois.

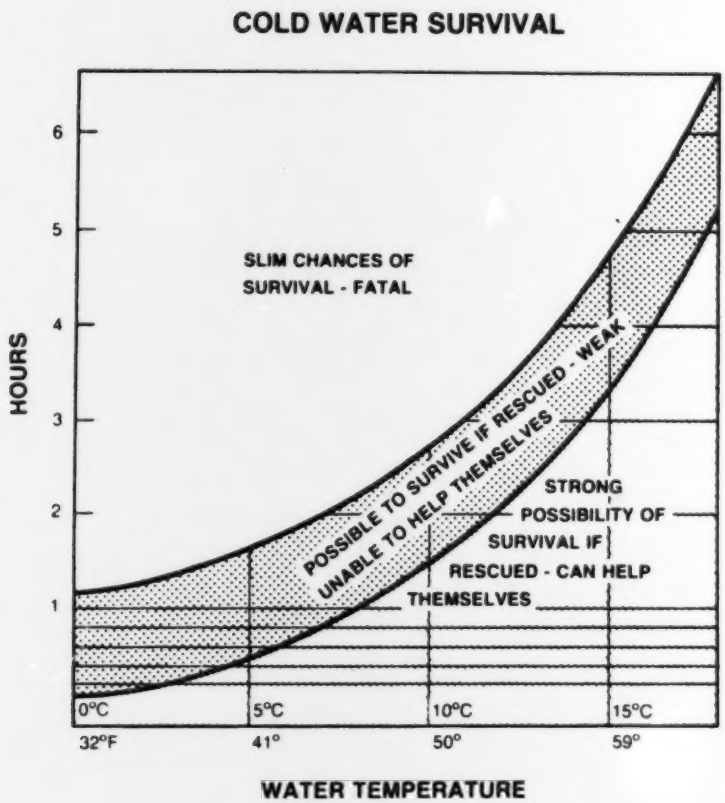


Photograph No. 10 Photographie N° 10

Interior of fish-hold, showing portable panel access to lazaret, and no penboard divisions to prevent movement of bulk herring catch.

Intérieur de la cale à poisson montrant le panneau amovible donnant accès à la cambuse et sans planche de séparation afin d'empêcher le mouvement du hareng en vrac.

FIGURE No. 3



The accompanying graph shows average predicted survival times of average, adult humans in water of different temperatures. The figures are based on experimental cooling of average men and women who were holding still in ocean water and wearing a standard lifejacket and light clothing. The graph shows, for example, that predicted survival time is about 2½-3 hours in water of 10°C (50°F). Predicted survival time is increased by extra body fat and decreased by small body size. Although women generally possess slightly more fat than men they cool slightly faster due to their usually small body size. However, for comparable sizes, the man will cool faster.

"COLD WATER SURVIVAL"
CANADIAN RED CROSS